

DEPARTMENT OF TRANSPORTATION

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November 21, 2001

04-SM-280-R0.0/R9.0
04-135994
ACIM-280-1(100)22E

Addendum No. 2

Dear Contractor:

This addendum is being issued to the contract for construction on State highway in SAN MATEO COUNTY IN AND NEAR WOODSIDE FROM ALPINE ROAD UNDERCROSSING TO 1.6 km NORTH OF FARM HILL BOULEVARD.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

Bids for this work will be opened on December 4, 2001. The original bid opening date was previously postponed indefinitely under Addendum No. 1 dated November 7, 2001.

This addendum is being issued to set a new bid opening date as shown herein and revise the Project Plans, the Notice to Contractors and Special Provisions, the Proposal and Contract, and the Federal Minimum Wages with Modification Number 17 dated 11-16-01. A copy of the modified wage rates are available for the contractor's use on the Internet Site:

http://www.dot.ca.gov/hq/esc/oe/weekly_ads/addendum_page.html

Project Plan Sheets 2, 3, 4, 5, 8, 19, 25, 26, 27, 30, 31, 44, 45, and 46 are revised. Half-sized copies of the revised sheets are attached for substitution for the like-numbered sheets.

In the Special Provisions, Section 4, "BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES," is replaced as attached.

In the Special Provisions, Section 5-1.12, "FORCE ACCOUNT PAYMENT," is deleted.

In the Special Provisions, Section 5-1.16, "INTERIM ESTIMATE AND CLAIMS," is added as attached.

In the Special Provisions, Section 10-1.01, "ORDER OF WORK," the following paragraphs are added after the first paragraph.

"Attention is directed to "Shoulder Backing" of these special provisions regarding the use of portable delineators and C31 signs."

"Attention is directed to "Replace Concrete Pavement (Rapid Strength Concrete)" of these special provisions regarding the pre-operation meeting."

In the Special Provisions, Section 10-1.05, "OVERHEAD," is deleted.

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In the Special Provisions, Section 10-1.07, "MOBILIZATION," the following paragraph is added after the first paragraph:

"After completion of the contract items of work, except the warranty, the amount, if any, of the contract item price for mobilization in excess of 10 percent of the original contract amount will be included for payment in the proposed interim estimate in conformance with the provisions in "Interim Estimate and Claims" of these special provisions."

In the Special Provisions, Section 10-1.165, "SHOULDER BACKING," is added as attached.

In the Special Provisions, Section 10-1.18, "ASPHALT CONCRETE," is replaced with the attached Section 10-1.18, "ASPHALT CONCRETE."

In the Special Provisions, Section 10-1.20, "RUBBERIZED ASPHALT CONCRETE (TYPE O)," is replaced with the attached Section 10-1.20, "RUBBERIZED ASPHALT CONCRETE (TYPE O-HB)."

In the Special Provisions, Section 10-1.21, "RETROFIT EXISTING CONCRETE PAVEMENT WITH DOWELS AT TRANSVERSE JOINTS", is deleted.

In the Special Provisions, Section 10-1.215, "WARRANTY," is added as attached.

In the Special Provisions, Section 10-1.22, "REPLACE CONCRETE PAVEMENT (FAST-SETTING CONCRETE)" is replaced with Section 10-1.22, "REPLACE CONCRETE PAVEMENT (RAPID STRENGTH CONCRETE)," as attached.

In the Special Provisions, Section 10-1.24, "TEXTURE GRIND EXISTING CONCRETE PAVEMENT," subparagraphs one and two of paragraph seven are replaced as follows:

- "1. Pavement on tangent alignments and pavement on horizontal curves having a centerline radius of curve 600 m or more shall have an average Profile Index of 8 mm or less for each 0.1 km.
2. Pavement on horizontal curves having a centerline radius of curve 300 m or more but less than 600 m and pavement within superelevation transition of those curves shall have an average Profile Index of 11 mm or less for each 0.1 km."

In the Special Provisions, Section 10-1.24, "TEXTURE GRIND EXISTING CONCRETE PAVEMENT," the following paragraphs are added after the tenth paragraph:

"After texture grinding, all areas texture ground shall be grooved in conformance with Section 42-1 "Grooving," of the Standard Specifications, except for payment.

Full compensation for grooving concrete pavement shall be considered as included in the contract price paid per square meter for texture grind existing concrete pavement and no separate payment will be made therefor."

In the Proposal and Contract, the Engineer's Estimate Item 9 is revised, Items 35 to 41 are added and Items 2, 15, 16, 17 and 34 are deleted as attached.

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To Proposal and Contract book holders:

Replace the entire Engineer's Estimate in the Proposal with the attached revised Engineer's Estimate. The revised Engineer's Estimate is to be used in the bid.

Indicate receipt of this addendum by filling in the number of this addendum in the space provided on the signature page of the proposal.

Submit bids in the Proposal and Contract book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.

Inform subcontractors and suppliers as necessary.

This office is sending this addendum by UPS overnight mail to Proposal and Contract book holders to ensure that each receives it.

If you are not a Proposal and Contract book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,

ORIGINAL SIGNED BY

REBECCA D. HARNAGEL, Chief
Plans, Specifications & Estimates Branch
Office of Office Engineer

Attachments

SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES

Attention is directed to the provisions in Section 8-1.03, "Beginning of Work," Section 8-1.06, "Time of Completion," and Section 8-1.07, "Liquidated Damages," of the Standard Specifications, and in "Interim Estimate and Claims" and "Warranty" of these special provisions.

The Contractor shall begin work within 15 calendar days after the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation.

The work, except the warranty, shall be diligently prosecuted to completion before the expiration of **240 WORKING DAYS** beginning on the fifteenth calendar day after approval of the contract.

The Contractor shall pay to the State of California the sum of \$850 per day, for each and every calendar day's delay in finishing the work, except the warranty, in excess of the number of working days prescribed above.

Attention is directed to "Warranty" of these special provisions regarding the warranty period after completion of the other contract items of work.

5-1.16 INTERIM ESTIMATE AND CLAIMS

Attention is directed to Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications and "Warranty" of these special provisions.

Upon completion of the contract items of work, except the warranty, the Engineer will make an interim inspection. If the Engineer determines that the contract work, except the warranty, has been completed in all respects in conformance with the requirements of the contract, or if the Contractor has been relieved of the duty of maintenance and protection of the contract item to which the warranty applies, the warranty period will immediately begin and the Engineer will notify the Contractor in writing of the start of the warranty period and the date on which the warranty will be complete.

If, upon completion of the interim inspection, the Engineer determines that the contract work, except the warranty, has been completed in all respects in conformance with the requirements of the contract, the Engineer will recommend that the Director relieve the Contractor of the duty of maintaining and protecting that work in conformance with the provisions in Section 7-1.15, "Relief from Maintenance and Responsibility," of the Standard Specifications, except that no further work will be required on the contract items of work other than temporary patches and repair work required by the warranty.

During the warranty period, the Contractor shall not be responsible for injury to persons or property, damage to the work and indemnification of the State as provided in Sections 7-1.12, "Indemnification and Insurance," and 7-1.125, "Legal Actions Against the State," of the Standard Specifications, except when performing work on the project.

Within 90 days of completion of the contract work, except the warranty, the Engineer will make a proposed interim estimate in writing of the total amount payable to the Contractor, including therein an itemization of the total amount, segregated as to contract item quantities, extra work and any other basis for payment, and shall also show therein all deductions made or to be made for prior payments and amounts to be kept or retained under the provisions of the contract, except that the proposed interim estimate will not include the contract lump sum item for warranty or other basis for payment, deductions or retentions accrued during the warranty period.

All prior estimates and payments shall be subject to correction in the proposed interim estimate. The Contractor shall submit written approval of the proposed interim estimate or a written statement of all claims arising under or by virtue of the contract, except claims arising during the warranty period, so that the Engineer receives the written approval or statement of claims no later than close of business of the thirtieth day after receiving the proposed interim estimate. If the thirtieth day falls on a Saturday, Sunday or legal holiday, then receipt of the written approval or statement of claims by the Engineer shall not be later than close of business of the next business day. No claim will be considered that was not included in the written statement of claims, nor will any claim be allowed as to which a notice or protest is required under the provisions in Sections 4-1.03, "Changes," 8-1.06, "Time of Completion," 8-1.07, "Liquidated Damages," 5-1.116, "Differing Site Conditions," 8-1.10, "Utility and Non-Highway Facilities," and 9-1.04, "Notice of Potential Claim," of the Standard Specifications, unless the Contractor has complied with the notice or protest requirements in those sections.

On the Contractor's approval, or if the Contractor files no claim within the specified period of 30 days, the Engineer will issue an interim final estimate in writing in accordance with the proposed interim estimate submitted to the Contractor, and within 30 days thereafter the State will pay the entire sum so found to be due. That interim final estimate and payment thereon shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except for the contract lump sum item for warranty and work performed during the warranty period and as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors" of the Standard Specifications.

If the Contractor within the specified period of 30 days files claims, the Engineer will issue a semifinal estimate in accordance with the proposed interim estimate submitted to the Contractor and within 30 days thereafter the State will pay the sum so found to be due. The semifinal estimate and payment thereon shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except for the contract lump sum item for warranty and work performed during the warranty period and insofar as affected by the claims filed within the time and in the manner required hereunder and except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors," of the Standard Specifications.

Claims filed by the Contractor shall be in sufficient detail to enable the Engineer to ascertain the basis and amount of those claims. If additional information or details are required by the Engineer to determine the basis and amount of the claims, the Contractor shall furnish additional information or details so that the additional information or details are received by the Engineer no later than the fifteenth day after receipt of the written request from the Engineer. If the fifteenth day falls on a Saturday, Sunday or legal holiday, then receipt of the information or details by the Engineer shall not be later than close of business of the next business day. Failure to submit the information and details to the Engineer within the time specified will be sufficient cause for denying the claim.

The Contractor shall keep full and complete records of the costs and additional time incurred for any work for which a claim for additional compensation is made. The Engineer or any designated claim investigator or auditor shall have access to those records and any other records as may be required by the Engineer to determine the facts or contentions involved in the claims. Failure to permit access to those records shall be sufficient cause for denying the claims.

Claims submitted by the Contractor shall be accompanied by the notarized certificate specified in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications.

Failure to submit the notarized certificate will be sufficient cause for denying the claim.

Any claim for overhead type expenses or costs, in addition to being certified as stated above, shall be supported by an audit report of an independent Certified Public Accountant. Any claim for overhead shall also be subject to audit by the State at its discretion.

Any costs or expenses incurred by the State in reviewing or auditing any claims that are not supported by the Contractor's cost accounting or other records shall be deemed to be damages incurred by the State within the meaning of the California False Claims Act.

The District Director of the District which administers the contract will make the final determination of any claims which remain in dispute after completion of claim review by the Engineer. A board or person designated by the District Director will review those claims and make a written recommendation thereon to the District Director. The Contractor may meet with the review board or person to make a presentation in support of those claims.

Upon final determination of the claims, the Engineer will then make and issue the Engineer's interim final estimate in writing and within 30 days thereafter the State will pay the entire sum, if any, found due thereon. That interim final estimate shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except the contract lump sum item for warranty and for work performed during the warranty period and as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors" of the Standard Specifications.

When the warranty period has expired and the Engineer has made the determination that all work required by the warranty has been satisfactorily completed in conformance with the requirements of the contract, the Engineer will recommend that the Director formally accept the contract in conformance with the provisions in Section 7-1.17, "Acceptance of the Contract," of the Standard Specifications.

After acceptance of the contract by the Director, the Engineer will make a proposed final estimate in conformance with the provisions in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. Any written statement of claims shall only include claims arising during the warranty period, either under or by virtue of the contract or due to work ordered by the Engineer.

Arbitration of contract claims in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications shall not be initiated until after acceptance of the contract.

10-1.165 SHOULDER BACKING

This work shall consist of constructing shoulder backing adjacent to the edge of the new surfacing in conformance with the details shown on the plans and these special provisions.

The material for shoulder backing shall be imported material conforming to the following grading and quality requirements:

Grading Requirements		Quality Requirements		
Sieve Sizes	Percentage Passing	Specification	California Test	Requirement
50-mm	100	Sand Equivalent	217	10 min.
25-mm	65 - 100	Resistance (R-value)	301	50 min.
4.75-mm	35 - 80	Plasticity Index	204	1 min.
600-µm	15 - 55			
75-µm	5 - 25			

The areas where shoulder backing is to be constructed shall be cleared of weeds, grass and debris. Removed weeds and grass shall be disposed of uniformly over adjacent slope areas and removed debris shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Shoulder backing material shall be watered and rolled to form a smooth, firmly compacted surface. Watering shall conform to the provisions in Section 17, "Watering," of the Standard Specifications.

Shoulder backing material shall not be deposited on the new surfacing prior to placing the material in the final position nor shall the material be deposited onto the new surfacing during mixing, watering, and blading operations.

Shoulder backing construction shall be completed along the edges of a portion of new surfacing within 5 days after completion of that portion of the new surfacing. Prior to opening a lane, adjacent to uncompleted shoulder backing, to uncontrolled public traffic, the Contractor shall furnish, place, and maintain portable delineators and C31 (Low Shoulder) signs off of and adjacent to the new surfacing. Portable delineators shall be placed at the beginning and along the drop-off of the edge of pavement, in the direction of travel, at successive maximum intervals of 150 m on tangents and 60 m on curves. C31 signs shall be placed at the beginning and along the drop-off at successive maximum intervals of 600 m. The portable delineators and C31 signs shall be maintained in place at each location until shoulder backing is completed at that location. Portable delineators and signs shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, except the signs may be set on temporary portable supports or on barricades.

Shoulder backing will be measured by the station along each edge of surfacing where shoulder backing is constructed. A station shall be considered to be 100 meters. The length of shoulder backing to be paid for will be determined from actual measurement or calculated from centerline stationing or kilometer post distance determined by the Engineer.

The contract price paid per station for shoulder backing shall include full compensation for furnishing all labor, materials (except imported material), tools, equipment, and incidentals, and for doing all the work involved in constructing shoulder backing, complete in place, including furnishing, placing, maintaining, and removing portable delineators, C31 signs, and temporary supports or barricades for the signs, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Quantities of imported material (shoulder backing) will be measured by the tonne in conformance with the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications, except that the mass of water in the aggregate will not be determined and no deduction will be made from the mass of material delivered to the work.

The contract price paid per tonne for imported material (shoulder backing) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, hauling, and depositing imported material for shoulder backing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.18 ASPHALT CONCRETE

Asphalt concrete for replace asphalt concrete surfacing shall be Type A and asphalt concrete for paving shoulders shall be Open Graded and shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

Open graded asphalt concrete may be placed when the atmospheric temperature is below 20.0°C, but above 10.0°C, provided the following requirements are met:

- A. The aggregate grading shall be 12.5-mm maximum.
- B. Open graded asphalt concrete shall not be placed in a stockpile. Open graded asphalt concrete shall be transferred directly from the hauling vehicle to the asphalt paver hopper or windrow.
- C. Open graded asphalt concrete shall be not less than 30 mm in compacted thickness.
- D. Immediately prior to adding the asphalt binder to the open graded asphalt concrete mixture, the temperature of the aggregate shall be not more than 163°C. Open graded asphalt concrete shall be spread at a temperature of not less than 135°C measured in the hopper in the asphalt paver.
- E. The compaction operation shall be such that the maximum distance between the asphalt paver and the initial breakdown rolling shall be no greater than 15 m.
- F. The Contractor shall cover loads of open graded asphalt concrete with tarpaulins. The tarpaulins shall completely cover exposed open graded asphalt concrete in the hauling vehicle until the open graded asphalt concrete has been completely transferred into the asphalt paver hopper or windrow.
- G. Paint binder for open graded asphalt concrete shall, at the Contractor's option, be either rapid setting asphaltic emulsion spread at a rate of 0.45 to 0.54 liters per square meter, or paving asphalt spread at a rate of 0.28 to 0.41 liters per square meter. The exact rate of application will be determined by the Engineer.

The grade of asphalt binder to be mixed with aggregate for Open Graded asphalt concrete shall be PBA Grade 6a and shall conform to the provisions in "Asphalt" of these special provisions.

The aggregate for Type A asphalt concrete shall conform to the 19-mm, maximum, medium grading specified in Section 39-2.02, "Aggregate," of the Standard Specifications.

10-1.20 RUBBERIZED ASPHALT CONCRETE (TYPE O-HB)

Rubberized asphalt concrete (Type O-HB) shall consist of furnishing and mixing Open Graded aggregate and asphalt-rubber binder and spreading and compacting the mixture. Type O-HB rubberized asphalt concrete shall conform, except as otherwise provided, to the requirements specified for Open Graded asphalt concrete in Section 39, "Asphalt Concrete," of the Standard Specifications and to these special provisions.

GENERAL.—The Contractor shall furnish samples of aggregate to the Engineer in conformance with the provisions in Section 39-3.03, "Proportioning," of the Standard Specifications.

The amount of asphalt-rubber binder to be mixed with the aggregate for Type O-HB rubberized asphalt concrete will be determined by the Engineer using the samples of aggregates furnished by the Contractor in conformance with the provisions in Section 39-3.03, "Proportioning," of the Standard Specifications. The Engineer will determine the exact amount of asphalt-rubber binder to be mixed with the aggregate in accordance with the provisions in California Test 368 with the following exceptions. The aggregate shall be mixed with AR-4000 paving asphalt and the optimum bitumen content shall be determined in accordance with the test procedure. The optimum binder content for rubberized asphalt concrete Type O-HB shall then be determined using the following formula:

$$OBC_2 = (OBC_1) \times 1.65$$

OBC₁ = Optimum bitumen content using AR-4000 paving asphalt
OBC₂ = Optimum bitumen content using asphalt-rubber binder

The OBC₂ shall be a minimum of 8.5 percent by weight of dry aggregate and a maximum of 10.0 percent by dry weight of the aggregate. Aggregates which result in an OBC₂ of less than 8.5 percent or more than 10.0 percent by weight of dry aggregate shall not be used.

The asphalt-rubber binder content of the Type O-HB rubberized asphalt concrete will be determined by extraction tests in accordance with the provisions in California Test 362, or will be determined in accordance with the provisions in California Test 379.

The Contractor shall furnish to the Engineer a Certificate of Compliance in accordance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for each material used in asphalt-rubber binder and the asphalt-rubber binder mixture. The Certificate of Compliance shall certify that the material conforms to the requirements in these special provisions. When requested by the Engineer, the Contractor shall also submit samples with the Certificate of Compliance. The Contractor shall provide the Engineer a Material Safety Data Sheet (MSDS) for each of the constituent components of the asphalt-rubber binder, for the completed mixture of asphalt-rubber binder and for the Type O-HB rubberized asphalt concrete.

The Contractor shall provide a Certificate of Compliance for each truck load of crumb rubber modifier (CRM), paving asphalt and asphalt modifier delivered to the project. The Quality Control Program used by the manufacturer of each ingredient shall include a sampling and testing frequency as shown below.

CRM shall be tested except for the grading requirement, at least once for every 225 tonnes with a minimum of once per project. CRM shall be tested for grading for every truck load delivered to the project.

Paving asphalt shall be tested at least once for every 180 tonnes of production with a minimum of once per project.

Asphalt modifier shall be tested at least once for every 23 tonnes of production with a minimum of once per project.

A copy of the laboratory test results for the test parameters specified in these special provisions for CRM, paving asphalt and asphalt modifier shall be submitted to the Engineer with the Certificate of Compliance for each truck load of individual material delivered to the project.

PAVING ASPHALT.—The grade of paving asphalt to be used in the asphalt-rubber binder shall be AR-4000 and shall conform to the provisions in Section 92, "Asphalts," of the Standard Specifications and these special provisions.

The paving asphalt for use in asphalt-rubber binder shall be modified with an asphalt modifier.

ASPHALT MODIFIER.—The asphalt modifier will be a resinous, high flash point, aromatic hydrocarbon compound and shall conform to the following requirements:

ASPHALT MODIFIER

Test Parameter	ASTM	
	Designation	Requirement
Viscosity, m ² /s (x10 ⁻⁶) at 100°C	D 445	X ± 3*
Flash Point, CL.O.C., °C	D 92	207 min.
Molecular Analysis:		
Asphaltenes, percent by mass	D 2007	0.1 max.
Aromatics, percent by mass	D 2007	55 min.

* The symbol "X" is the viscosity of the asphalt modifier the Contractor proposes to furnish. The value "X" which the Contractor proposes shall be between the limits 19 and 36 and shall be submitted in writing to the Engineer. Any proposed change, requested by the Contractor, in the value "X" shall require a new asphalt-rubber binder design.

The asphalt modifier shall be proportionately added at the production site where the asphalt-rubber binder is blended and reacted. Asphalt modifier shall be added to the paving asphalt at an amount of 2.5 to 6.0 percent by mass of the paving asphalt based on the recommendation of the asphalt-rubber binder supplier. The exact amount will be determined by the Engineer. The paving asphalt shall be at a temperature of not less than 190°C nor more than 226°C when the asphalt modifier is added. If the asphalt modifier is combined with the paving asphalt, before being blended with the CRM, the combined paving asphalt and asphalt modifier shall be mixed by circulation for a period of not less than 20 minutes. This premixing of asphalt modifier and the paving asphalt will not be required when the ingredients of the asphalt-rubber binder are proportioned and mixed simultaneously. Asphalt modifier and paving asphalt shall be measured for proportioning with meters conforming to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

CRUMB RUBBER MODIFIER (CRM).—Crumb rubber modifier (CRM) shall consist of a combination of scrap tire CRM and high natural CRM. The scrap tire CRM shall consist of ground or granulated rubber derived from any combination of automobile tires, truck tires or tire buffings. The high natural CRM shall consist of ground or granulated rubber derived from materials that utilize high natural rubber sources.

Steel and fiber separation may be accomplished by any method. Cryogenic separation, if utilized, shall be performed separately from and prior to grinding or granulating.

CRM shall be ground or granulated at ambient temperature. Cryogenically produced CRM particles which can pass through the grinder or granulator without being ground or granulated respectively, shall not be used.

CRM shall not contain more than 0.01-percent wire (by mass of CRM) and shall be free of other contaminants, except fabric. Fabric shall not exceed 0.05-percent by mass of CRM. The test and method for determining the percent by mass of wire and fabric is available at the Transportation Laboratory, Pavement Consulting Services Branch, Sacramento, California, Telephone (916) 227-7295, and will be furnished to interested persons upon request. A Certificate of Compliance certifying these percentages shall be furnished to the Engineer in accordance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

The length of any individual CRM particle shall not exceed 4.75 mm.

The CRM shall be sufficiently dry so as to be free flowing and not produce foaming when combined with the blended paving asphalt and asphalt modifier mixture. Calcium carbonate or talc may be added at a maximum amount of 3 percent by weight of CRM to prevent CRM particles from sticking together. The CRM shall have a specific gravity between 1.1 and 1.2 as determined in accordance with the requirements in California Test 208. Scrap tire CRM and high natural CRM shall be delivered to the production site in separate bags and shall be sampled and tested separately. CRM material shall conform to the following requirements as determined in accordance with the requirements in ASTM Designation: D 297:

SCRAP TIRE CRUMB RUBBER MODIFIER

Test Parameter	Percent	
	Min.	Max.
Acetone Extract	6.0	16.0
Ash Content	—	8.0
Carbon Black Content	28.0	38.0
Rubber Hydrocarbon	42.0	65.0
Natural Rubber Content	22.0	39.0

HIGH NATURAL CRUMB RUBBER MODIFIER

Test Parameter	Percent	
	Min.	Max.
Acetone Extract	4.0	16.0
Rubber Hydrocarbon	50.0	—
Natural Rubber Content	40.0	48.0

The CRM for asphalt-rubber binder shall conform to the gradations specified below when tested in accordance with the requirements in ASTM Designation: C 136 amended as follows:

Split or quarter 100 grams ± 5 grams from the CRM sample and dry to a constant mass at a temperature of not less than 57°C nor more than 63°C and record the dry sample mass. Place the CRM sample and 5.0 grams of talc in a 0.5-L jar. Seal the jar, then shake it by hand for a minimum of one minute to mix the CRM and the talc. Continue shaking or open the jar and stir until particle agglomerates and clumps are broken and the talc is uniformly mixed.

Place one rubber ball on each sieve. Each ball shall have a mass of 8.5 ± 0.5 grams, have a diameter of 24.5 ± 0.5 mm, and shall have a Shore Durometer "A" hardness of 50 ± 5 in accordance with the requirements in ASTM Designation: D 2240. After sieving the combined material for 10 minutes ± 1 minute, disassemble the sieves. Any material adhering to the bottom of a sieve shall be brushed into the next finer sieve. Weigh and record the mass of the material retained on the 2.36-mm sieve and leave this material (do not discard) on the scale or balance. Any observed fabric balls shall remain on the scale or balance and shall be placed together on the side of the scale or balance to prevent the fabric balls from being covered or disturbed when placing the material from finer sieves onto the scale or balance. The material retained on the next finer sieve (2.00-mm sieve) shall be added to the scale or balance. Weigh and record that mass as the accumulative mass retained on that sieve (2.00-mm sieve). Continue weighing and recording the accumulated masses retained on the remaining sieves until the accumulated mass retained in the pan has been determined. Prior to discarding the CRM sample, separately weigh and record the total mass of fabric balls in the sample.

Determine the mass of material passing the 75- μ m sieve (or mass retained in the pan) by subtracting the accumulated mass retained on the 75- μ m sieve from the accumulated mass retained in the pan. If the material passing the 75- μ m sieve (or mass retained in the pan) has a mass of 5 grams or less, cross out the recorded number for the accumulated mass retained in the pan and copy the number recorded for the accumulated mass retained on the 75- μ m sieve and record that number (next to the crossed out number) as the accumulated mass retained in the pan. If the material passing the 75- μ m sieve (or mass retained in the pan) has a mass greater than 5 grams, cross out the recorded number for the accumulated mass retained in the pan, subtract 5 grams from that number and record the difference next to the crossed out number. The adjustment to the accumulated mass retained in the pan is made to account for the 5 grams of talc added to the sample. For calculation purposes, the adjusted total sample mass is the same as the adjusted accumulated mass retained in the pan. Determine the percent passing based on the adjusted total sample mass and record to the nearest 0.1 percent.

CRM GRADATIONS

Sieve Size	Scrap Tire CRM Percent Passing	High Natural CRM Percent Passing
2.36-mm	100	100
2.00-mm	98-100	100
1.18-mm	45-75	95-100
600- μ m	2-20	35-85
300- μ m	0-6	10-30
150- μ m	0-2	0-4
75- μ m	0	0-1

ASPHALT-RUBBER BINDER.—Asphalt-rubber binder shall consist of a mixture of paving asphalt, asphalt modifier and crumb rubber modifier.

At least 2 weeks before its intended use, the Contractor shall furnish to the Engineer 4 one-liter cans filled with the asphalt-rubber binder proposed for use on the project. The Contractor shall supply to the Engineer for approval a binder formulation and samples of the materials to be used in the asphalt-rubber binder, at least 2 weeks before construction is scheduled to begin. The binder formulations shall consist of the following information:

Paving Asphalt and Modifiers

- (1) Source and grade of paving asphalt.
- (2) Source and identification (or type) of modifiers used.
- (3) Percentage of asphalt modifier by mass of paving asphalt.
- (4) Percentage of the combined blend of paving asphalt and asphalt modifier by total mass of asphalt-rubber binder to be used.
- (5) Laboratory test results for test parameters shown elsewhere in these special provisions.

Crumb Rubber Modifier (CRM)

- (1) Source and identification (or type) of scrap tire and high natural CRM.
- (2) Percentage of scrap tire and high natural CRM by total mass of the asphalt-rubber blend.
- (3) If CRM from more than one source is used, the above information will be required for each CRM source used.
- (4) Laboratory test results for test parameters shown elsewhere in these special provisions.

Asphalt-Rubber Binder

- (1) Laboratory test results of the proposed blend for test parameters shown elsewhere in these special provisions.
- (2) The minimum reaction time and temperature.

The method and equipment for combining paving asphalt, asphalt modifier and CRM shall be so designed and accessible that the Engineer can readily determine the percentages by mass for each material being incorporated into the mixture.

The proportions of the materials, by total mass of asphalt-rubber binder, shall be 80 ± 2 percent combined paving asphalt and asphalt modifier, and 20 ± 2 percent CRM. However, the minimum amount of CRM shall not be less than 18.0 percent. Lower values which are rounded up shall not be allowed. The CRM shall be combined at the production site and shall contain 75 ± 2 percent scrap tire CRM and 25 ± 2 percent high natural CRM, by mass.

The paving asphalt and asphalt modifier shall be combined into a blended mixture that is chemically compatible with the crumb rubber modifier to be used. The blended mixture is considered to be chemically compatible when it meets the requirements for asphalt-rubber binder (after reacting) found elsewhere in these special provisions.

The blended paving asphalt and asphalt modifier mixture, and the CRM shall be combined and mixed together at the production site in a blender unit to produce a homogeneous mixture.

The temperature of the blended paving asphalt and asphalt modifier mixture shall be not less than 190°C nor more than 226°C when the CRM is added. The combined materials shall be reacted for a minimum of 45 minutes after incorporation of the CRM at a temperature of not less than 190°C nor more than 218°C. The temperature shall not be higher than 6°C below the actual flash point of the asphalt-rubber binder.

After reacting, the blended asphalt-rubber binder shall conform to the following requirements:

ASPHALT-RUBBER BINDER

Test Parameter	ASTM Test Method	Requirement	
		Min.	Max.
Cone Penetration @ 25°C, 1/10 mm	D 217	25	70
Resilience @ 25°C, Percent rebound	D 3407	18	—
Field Softening Point, °C	D 36	52	74
Viscosity @ 190°C, Pa • s ($\times 10^{-3}$)	See Note	1500	4000

NOTE: The viscosity test shall be conducted using a hand held Haake Viscometer Model VT-02 with Rotor 1, 24 mm in depth x 53 mm in height, or equivalent, as determined by the Engineer. The accuracy of the viscometer shall be verified by comparing the viscosity results obtained with the hand held viscometer to 3 separate calibration fluids of known viscosities ranging from 1000 to 5000 Pa • s ($\times 10^{-3}$). The viscometer will be considered accurate if the values obtained are within 300 Pa • s ($\times 10^{-3}$) of the known viscosity. The known viscosity value shall be based on the fluid manufacturers standard test temperature or the test temperature versus viscosity correlation table provided by the fluid manufacturer. Viscometers used on the project shall be verified to be accurate. The test method for determining the viscosity of asphalt-rubber binder using a hand held viscometer is available at the Transportation Laboratory, Pavement Consulting Services Branch, Sacramento, California, Telephone (916) 227-7108. The accuracy verification results shall be provided to the Engineer and shall be certified by a Certificate of Compliance. The Certificate of Compliance shall be furnished to the Engineer in accordance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

The Contractor shall provide a Haake Viscometer, or equivalent, at the production site during the combining of asphalt-rubber binder materials. The Contractor shall take viscosity readings of asphalt-rubber binder from samples taken from the feed line connecting the storage and reaction tank and the asphalt concrete plant. Readings shall be taken at least every hour with no less than one reading for each batch of asphalt-rubber binder. The Contractor shall log these results including time and asphalt-rubber binder temperature, and a copy of the log shall be submitted to the Engineer on a daily basis. As determined by the Engineer, the Contractor shall either notify the Engineer at least 15 minutes prior to each test or provide the Engineer a schedule of testing times.

The reacted asphalt-rubber binder shall be maintained at a temperature of not less than 190°C nor more than 218°C.

If any of the material in a batch of asphalt-rubber binder is not used within four hours after the 45-minute reaction period, heating of the material shall be discontinued. Any time the asphalt-rubber binder cools below 190°C and then is reheated, shall be considered a reheat cycle. The total number of reheat cycles shall not exceed 2. The material shall be uniformly reheated to a temperature of not less than 190°C nor more than 218°C prior to use. Additional scrap tire CRM may be added to the reheated binder and reacted for a minimum of 45 minutes. The cumulative amount of additional scrap tire CRM shall not exceed 10 percent of the total binder mass. Reheated asphalt-rubber binder shall conform to the requirements for blended asphalt-rubber binder.

EQUIPMENT FOR PRODUCTION OF ASPHALT-RUBBER BINDER.—The Contractor shall utilize the following equipment for production of asphalt-rubber binder:

1. An asphalt heating tank equipped to heat and maintain the blended paving asphalt and asphalt modifier mixture at the necessary temperature before blending with the CRM. This unit shall be equipped with a thermostatic heat control device and a temperature reading device and shall be accurate to within $\pm 3^{\circ}\text{C}$ and shall be of the recording type.
2. A mechanical mixer for the complete, homogeneous blending of paving asphalt, asphalt modifier and CRM. Paving asphalt and asphalt modifier shall be introduced into the mixer through meters conforming to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications. The blending system shall be capable of varying the rate of delivery of paving asphalt and asphalt modifier proportionate with the delivery of CRM. During the proportioning and blending of the liquid ingredients, the temperature of paving asphalt and the asphalt modifier shall not vary more than $\pm 14^{\circ}\text{C}$. The paving asphalt feed, the asphalt modifier feed and CRM feed, shall be equipped with devices by which the rate of feed can be determined during the proportioning operation. Meters used for proportioning individual ingredients shall be equipped with rate-of-flow indicators to show the rates of delivery and resettable totalizers so that the total amounts of liquid ingredients introduced into the mixture can be determined. The liquid and dry ingredients shall be fed directly into the mixer at a uniform and controlled rate. The rate of feed to the mixer shall not exceed that which will permit complete mixing of the materials. Dead areas in the mixer, in which the material does not move or is not sufficiently agitated, shall be corrected by a reduction in the volume of material or by other adjustments. Mixing shall continue until a homogeneous mixture of uniformly distributed and properly blended asphalt-rubber binder of unchanging appearance and consistency is produced. The Contractor shall provide a safe sampling device capable of delivering a representative sample of the completed asphalt-rubber binder of sufficient size to permit the required tests.
3. An asphalt-rubber binder storage tank equipped with a heating system furnished with a temperature reading device to maintain the proper temperature of the asphalt-rubber binder and an internal mixing unit capable of maintaining a homogeneous mixture of blended paving asphalt, asphalt modifier and CRM.

The equipment shall be approved by the Engineer prior to use.

AGGREGATE.—The aggregate for Type O-HB rubberized asphalt concrete shall conform to the quality requirements specified in Section 39-2.02, "Aggregate," of the Standard Specifications. California Test 205, Section D, definition of a crushed particle is revised as follows: "Any particle having 2 or more fresh mechanically fractured faces shall be considered a crushed particle". The aggregate grading shall conform to the following requirements:

AGGREGATE GRADING REQUIREMENT

Sieve Size	Percentage Passing		
	12.5 mm Maximum		
	Limits of Proposed Gradation	Operating Range	Contract Compliance
19 mm		100	100
12.5 mm		97-100	95-100
9.5 mm	85-95	X \pm 4	X \pm 7
4.75 mm	10-25	X \pm 4	X \pm 7
2.36 mm	6-8	X \pm 3	X \pm 4
75 μm		0-3	0-4

PROPORTIONING, SPREADING AND COMPACTING.—When batch type asphalt concrete plants are used to produce Type O-HB rubberized asphalt concrete, the asphalt-rubber binder and mineral aggregate shall be proportioned by mass.

If the Contractor selects the batch mixing method, asphalt concrete (Type O-HB) shall be produced by the automatic batch mixing method in conformance with the provisions in Section 39-3.03A(2), "Automatic Proportioning," of the Standard Specifications.

If the finished surface of the asphalt concrete on Route 280 traffic lanes does not meet the specified surface tolerances, the surfacing shall be brought within tolerance by either (1) abrasive grinding (with fog seal coat on the areas which have been ground), (2) removal and replacement, or (3) placing an overlay of asphalt concrete. The method will be selected by the Engineer. The corrective work shall be at the Contractor's expense.

If abrasive grinding is used to bring the finished surface to the specified surface tolerances, additional grinding shall be performed, as necessary, to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from, and parallel to, the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline, within any ground area. Ground areas shall be neat rectangular areas of uniform surface appearance. Abrasive grinding shall conform to the provisions in the first paragraph and the last 4 paragraphs in Section 42-2.02, "Construction," of the Standard Specifications.

When continuous mixing type asphalt concrete plants are used to produce Type O-HB rubberized asphalt concrete, the asphalt-rubber binder shall be proportioned by an asphalt meter of the mass flow, Coriolis effect type. The meter shall have been Type-approved by the Division of Measurement Standards prior to the start of production. The meter shall be calibrated in accordance with the provisions in California Test 109. The meter shall be interfaced with the existing continuous mixing plant controller in use on the asphalt concrete plant.

Type O-HB rubberized asphalt concrete shall be placed only when the atmospheric and pavement surface temperatures are 10°C and above.

When the atmospheric and pavement surface temperature is 18°C or higher, the following shall apply:

1. The temperature of the aggregate shall not be greater than 163°C at the time the asphalt-rubber binder is added to the aggregate.
2. Type O-HB rubberized asphalt concrete shall be spread at a temperature of not less than 138°C nor more than 163°C, measured in the mat directly behind the paving machine.
3. The first coverage of initial or breakdown compaction shall be performed when the temperature of the Type O-HB rubberized asphalt concrete is not less than 135°C, and all breakdown compaction shall be completed before the temperature of the Type O-HB rubberized asphalt concrete drops below 121°C.

When the atmospheric or pavement surface temperature is below 18°C, the following shall apply:

1. The temperature of the aggregate shall not be less than 149°C nor more than 163°C at the time the asphalt-rubber binder is added to the aggregate.
2. The Contractor shall cover loads of Type O-HB rubberized asphalt concrete with tarpaulins. The tarpaulins shall completely cover exposed Type O-HB rubberized asphalt concrete until the Type O-HB rubberized asphalt concrete has been completely transferred into the asphalt concrete paver hopper or deposited on the roadbed.
3. Type O-HB rubberized asphalt concrete shall be spread at a temperature of not less than 143°C nor more than 163°C, measured in the mat directly behind the paving machine.
4. The first coverage of initial or breakdown compaction shall be performed when the temperature of the Type O-HB rubberized asphalt concrete is not less than 138°C, and all breakdown compaction shall be completed before the temperature of the Type O-HB rubberized asphalt concrete drops below 127°C.

Pneumatic tired rollers shall not be used to compact Type O-HB rubberized asphalt concrete.

In addition to the provisions in Section 39-5.01, "Spreading Equipment," of the Standard Specifications, asphalt paving equipment shall be equipped with automatic screed controls and a sensing device or devices.

When placing asphalt concrete Type O-HB to the lines and grades established by the Engineer, the automatic controls shall control the longitudinal grade and transverse slope of the screed. Grade and slope references shall be furnished, installed, and maintained by the Contractor. Should the Contractor elect to use a ski device, the minimum length of the ski device shall be 9 m. The ski device shall be a rigid one piece unit and the entire length shall be utilized in activating the sensor.

When placing the initial mat of asphalt concrete Type O-HB on existing pavement, the end of the screed nearest the centerline shall be controlled by a sensor activated by a ski device not less than 9 m long. The end of the screed farthest from centerline shall be controlled by a sensor activated by a similar ski device.

When paving contiguously with previously placed mats, the end of the screed adjacent to the previously placed mat shall be controlled by a sensor that responds to the grade of the previously placed mat and will reproduce the grade in the new mat within a 3-mm tolerance. The end of the screed farthest from the previously placed mat shall be controlled in the same way it was controlled when placing the initial mat.

Should the methods and equipment furnished by the Contractor fail to produce a layer of asphalt concrete Type O-HB conforming to the provisions, including straightedge tolerance, of Section 39-6.03, "Compacting," of the Standard Specifications, the paving operations shall be discontinued and the Contractor shall modify the equipment or methods, or furnish substitute equipment.

Should the automatic screed controls fail to operate properly during a day's work, the Contractor may manually control the spreading equipment for the remainder of that day. However, the equipment shall be corrected or replaced with alternative automatically controlled equipment conforming to the provisions in this section before starting another day's work.

The area to which paint binder has been applied shall be closed to public traffic. Care shall be taken to avoid tracking binder material onto existing pavement surfaces beyond the limits of construction. Paint binder shall be rapid setting asphaltic emulsion spread at a rate of 0.45 to 0.54 liters per square meter of existing AC surface covered, and spread at a rate of 0.22 to 0.45 liters per square meter of existing PCC surface covered. The exact rate of application will be determined by the Engineer.

Shoulders or median borders adjacent to a lane being paved shall be surfaced prior to opening the lane to public traffic.

Traffic shall not be allowed on the Type O-HB rubberized asphalt concrete until final rolling operations have been completed and sand has been applied to the surface.

Sand shall be spread on the surface of Type O-HB rubberized asphalt concrete at a rate of 0.5 to 1.0 kg/m². The exact rate will be determined by the Engineer. When ordered by the Engineer excess sand shall be removed from the pavement surface by sweeping. Sand shall be free from clay or organic material. Sand shall conform to the fine aggregate grading requirements in accordance with the provisions in Section 90-3.03, "Fine Aggregate Grading," of the Standard Specifications.

MEASUREMENT AND PAYMENT.—Rubberized asphalt concrete (Type O-HB) will be measured and paid for by the tonne in the same manner specified for asphalt concrete in Section 39-8, "Measurement and Payment," of the Standard Specifications.

Full compensation for furnishing and spreading sand on the rubberized asphalt concrete surfacing and for sweeping and removing excess sand from the pavement surface shall be considered as included in the contract price paid per tonne for rubberized asphalt concrete (Type O-HB) and no separate payment will be made therefor.

10-1.215 WARRANTY

The Contractor shall warranty the materials and workmanship of the rubberized asphalt concrete (RAC) (Type O-HB), for a period of 12 months, and shall repair defects identified during the warranty period, in conformance with these special provisions. The warranty period shall start and end in conformance with the provisions in "Interim Estimate and Claims" of these special provisions.

Attention is directed to "Rubberized Asphalt Concrete (Type O-HB)" of these special provisions.

During the warranty period, should any area of rubberized asphalt concrete (Type O-HB) be found to be defective, the Engineer will notify the Contractor in writing of any needed repairs. The Contractor shall complete the repairs within 60 days from the date of notification, unless the Engineer determines that weather conditions are unsuitable for completing the repair work, in which case the Engineer will allow additional time for completion of the repairs.

The Engineer shall decide all questions which arise as to the performance of the rubberized asphalt concrete (Type O-HB) during the warranty period and as to the acceptable fulfillment of the warranty, in conformance with the provisions in Section 5-1.01, "Authority of the Engineer," of the Standard Specifications.

During the warranty period, construction area signs shall be, at the Contractor's option, either stationary mounted or portable signs conforming to the provisions in "Construction Area Signs" of these special provisions.

Should any area of the rubberized asphalt concrete (Type O-HB) over existing PCC or AC pavement prove defective within 12 months after acceptance of the Contract or relief from maintenance, the Contractor shall repair the RAC Type O-HB High Binder Content as specified herein. This warranty shall not apply to defects that are caused by the pavement condition prior to placement of RAC Type O-HB High Binder Content. At least 7 days prior to beginning placement of the rubberized asphalt concrete (Type O-HB) over existing AC or PCC pavement, the Contractor shall submit to the Engineer a written list of existing defective areas, identifying the lane direction, lane number, starting and ending highway post locations and defect type. Within 4 days of receiving the list of existing defective areas, the Engineer will review the list and provide the Contractor written approval or revisions of the areas, as being excluded from the warranty. Defects in the existing surfacing which may qualify areas for exclusion from the warranty include: rutting, patches of asphalt concrete, cracking caused by thermal expansion and contraction, and reflective cracking caused by the construction joints of existing PCC pavement, existing cracks greater than 6 mm in width and existing cracks filled with emulsified filler within the last 12 months or filled with hot applied filler within the last 4 months will also be excluded from the warranty and all other performance criteria will apply.

When it is anticipated that there will be a suspension of work of more than 120 days, the Contractor may request in writing that a separate warranty period be established for the portion of rubberized asphalt concrete (Type O-HB) already completed. If the Engineer determines that the designated portion of rubberized asphalt concrete (Type O-HB) work has been completed in all respects in conformance with the requirements of the contract, the Engineer will recommend that the Director relieve the Contractor of the duty of maintaining and protecting the designated portion of rubberized asphalt concrete (Type O-HB) work in conformance with the provisions in Section 7-1.15, "Relief from Maintenance and Responsibility," of the Standard Specifications, except for work required by the warranty, and the Engineer will notify the Contractor in writing of the date of the start of the separate warranty period and the date on which the separate warranty period will be complete. The relief from maintenance and responsibility shall apply to the designated portion of rubberized asphalt concrete (Type O-HB) only, and does not constitute completion of any contract item of work. Upon completion of the separate warranty period, no further work will be required on the designated portion of rubberized asphalt concrete (Type O-HB). No separate interim estimate will be prepared for the designated portion of rubberized asphalt concrete (Type O-HB). No more than one separate warranty period will be allowed during the contract.

The following criteria shall apply to the rubberized asphalt concrete (Type O-HB) during the warranty period:

- A. Rutting consists of a longitudinal surface depression in the wheel path greater than 6 mm, measured in conformance with the provisions for testing the uniformity of the transverse slope in Section 39-6.03, "Compacting," of the Standard Specifications.
- B. Raveling consists of the separation of the aggregate from the binder, caused by wearing of the surface.
- C. Flushing consists of the occurrence of a film of bituminous material on the surface of the rubberized asphalt concrete (Type O-HB) which results in a coefficient of friction of less than 0.30, determined in conformance with the requirements in California Test 342.
- D. Delamination consists of the loss of the bond between the layers of pavement.

- E. Cracking consists of narrow breaks or fissures greater than 6 mm occurring in the rubberized asphalt concrete (Type O-HB). Cracking caused by thermal expansion and contraction, and reflective cracking caused by the construction joints of existing PCC pavement in the rubberized asphalt concrete (Type O-HB) should not be considered defective or failing to perform properly.
- F. Pot holes consist of the loss of rubberized asphalt concrete (Type O-HB) material, between 0.008-m² and 0.5-m², and typically with vertical sides.

Areas of rutting, raveling, flushing or delamination that are greater than 0.5-m², pot holes and cracking, shall be considered defective and shall be repaired. The final determination that an area is defective will be made by the Engineer. If the area between any 2 repairs, except repairs of pot holes and cracking, is less than 6 m in length, measured along the lane line, that area shall also be repaired.

Areas of rutting, raveling, flushing and delamination to be repaired shall be removed to the full depth of the rubberized asphalt concrete (Type O-HB), by cold planing in conformance with the provisions in "Cold Plane Asphalt Concrete Pavement" of these special provisions, for the full lane width and the length of the area determined to be defective, plus 2 m on each end measured along the lane line. The area planed shall then be repaired by placing rubberized asphalt concrete (Type O-HB) in conformance with the provisions in "Rubberized Asphalt Concrete (Type O-HB)" of these special provisions.

Cracking shall be repaired by cleaning and filling with crack sealant and aggregate in conformance with the following:

- A. The low modulus asphalt crack sealant shall be a mixture of paving asphalt and polymer conforming to the following requirements:

Test	Test Method	Requirements
Softening Point	ASTM D 36	82°C min.
Ductility @ 4° C., 1 cm./min., cm.	ASTM D 113	30 min.
Force Ductility @ 4° C.	Utah DOT Method Note (1)	18 N max
Flow	ASTM D 3407	3 mm max.
Note: (1) The Utah DOT Test Method is available for review at the Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, CA 95819		

- B. The sealant shall be capable of being melted and applied to cracks at temperatures below 204°C. When heated, it shall readily penetrate cracks 6 mm wide or wider.
- C. The low modulus asphalt crack sealant shall be furnished premixed in containers with an inside liner of polyethylene. Packaged material shall not exceed 30 kg in mass.
- D. The Contractor shall provide the Engineer with a Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificate of Compliance," of the Standard Specifications with each shipment of crack sealant. The certificate shall certify that the sealant complies with the specifications and shall be accompanied with storage and heating instructions and cautions for the material.
- E. Cracks that are 25-mm wide or wider shall be filled with sealant, flush with the rubberized asphalt concrete (Type O-HB). While the sealant is still hot, these cracks shall be covered with crushed aggregate conforming to the provisions for Type II slurry seal in Section 37-2.02C, "Aggregate," of the Standard Specifications and compacted with a wetted steel wheel roller or vibrating plate compactor large enough to compact the sealant.
- F. Cracks to be filled and adjacent rubberized asphalt concrete (Type O-HB) shall be free of dirt, vegetation, debris and loose sealant and shall be cleaned and dried by hot compressed air immediately prior to application of material.
- G. Crack sealant material shall be spread with any type nozzle or device approved for use by the Engineer that will place the material within the specified temperature range.
- H. Cracks shall be squeegeed when necessary after application of the crack sealant material.
- I. Within 2 days after application of sealant, sealed cracks that reopen or in which the sealant material sags below the surrounding asphalt concrete shall be resealed.

Pot holes shall be repaired by removing any remaining damaged material, and filling the hole with rubberized asphalt concrete (Type O-HB) in conformance with the provisions in "Rubberized Asphalt Concrete (Type O-HB)" of these special provisions.

Any areas of rutting, raveling, flushing, delamination, cracking or pot holes which create a condition hazardous to traffic shall be temporarily patched by placing a layer of commercially available paving grade asphalt concrete over the defective area, or filling pot holes with that material, to provide a temporary travelling surface, or shall be repaired as specified above. The Contractor shall begin placing temporary patches within 2 days after notification of the condition by the Engineer and shall complete the work within 3 days of that notification. Upon notification of the Contractor, the Engineer may make or cause to be made the needed temporary patches and provide a detailed billing to the Contractor for the work. The Contractor shall reimburse the State for the work within 60 days of receipt of the billing, or the costs may be deducted from any moneys due or to become due the Contractor under the contract. If the total area of temporary patching placed or to be placed exceeds 5 percent of any 160-m length of any lane or shoulder, the entire lane or shoulder for that 160-m length shall be repaired as specified above, and any temporary patches previously placed in that 160-m length shall be removed prior to placing the repair.

Temporary patches greater than 0.5-m² in area shall be removed and a repair placed by October 15 of each calendar year prior to expiration of the warranty period, or within 20 days after expiration of the warranty period, whichever occurs first. If the Engineer determines that a temporary patch provides an acceptable travelling surface, the patch may remain in place.

If the total length of repairs, measured along the lane line, exceeds 30 percent of any one-kilometer length of any lane or shoulder, an additional layer of rubberized asphalt concrete (Type O-HB) in conformance with the provisions in "Rubberized Asphalt Concrete (Type O-HB)" of these special provisions, 30 mm in thickness, shall be placed on that one-kilometer length on all lanes and shoulders. If a continuous area of 300 m or more in length, within that one-kilometer length, has not been repaired and does not contain defective areas, the additional layer of rubberized asphalt concrete (Type O-HB) will not be required on that area. If placement of the additional layer will interfere with the location, clearances or function of highway facilities, areas requiring the additional layer shall be removed to the full depth of the rubberized asphalt concrete (Type O-HB), by cold planing in conformance with the provisions in "Cold Plane Asphalt Concrete Pavement" of these special provisions, and rubberized asphalt concrete (Type O-HB) shall be placed in conformance with the provisions in "Rubberized Asphalt Concrete (Type O-HB)" of these special provisions.

As an alternative to the materials and methods specified above for repairs and temporary patches, the Contractor may use other materials or methods which will provide performance equal to or better than the rubberized asphalt concrete (Type O-HB) placed in conformance with the provisions in "Rubberized Asphalt Concrete (Type O-HB)" of these special provisions, if the alternative materials and methods are approved in writing by the Engineer, except no alternative to removing the full depth of the rubberized asphalt concrete (Type O-HB) will be allowed for areas of flushing.

Should the Contractor fail or refuse to comply with the requirements of the warranty, the Engineer may make or cause to be made the needed repair work and provide a detailed billing to the Contractor for the work. The Contractor shall reimburse the State for the work within 60 days of receipt of the billing, or the costs may be deducted from any moneys due or to become due the Contractor under the contract.

Temporary patches and repairs made or caused to be made by the State shall not void the warranty of the rubberized asphalt concrete (Type O-HB). The Contractor shall continue to warranty the rubberized asphalt concrete (Type O-HB), including areas patched or repaired by the Contractor or by the State, for the remainder of the warranty period.

Conflicts regarding the warranty shall be resolved utilizing the partnering relationship in conformance with the provisions in "Partnering" of these special provisions. If the Contractor's authorized representative, as specified in Section 5-1.06, "Superintendence," of the Standard Specifications, and the Engineer are unable to resolve the conflicts, the next level of resolution of the partnering process shall consist of the Contractor's project manager, the Engineer and representatives from the Department's materials and maintenance units. If no partnering relationship has been formed, the Engineer will notify the Contractor of the Department's decision regarding the conflicts.

Warranty will be paid for on a lump sum basis. The contract lump sum price paid for warranty shall include full compensation for providing a warranty for rubberized asphalt concrete (Type O-HB) and for furnishing all labor, materials, tools, equipment, and incidentals, and doing all the work involved in repairing defective areas in the rubberized asphalt concrete (Type O-HB), including job site inspection, placement and removal of temporary patches, cold planing, repair of defective areas, sealing cracks and replacement of traffic stripes, pavement markings and pavement markers obliterated by patches and repairs, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. Payment for the warranty item will be made in 10 equal payments. The first payment will be made on the third progress payment date after the warranty period begins, and subsequent payments will be made monthly thereafter.

Full compensation for furnishing construction area signs required for the direction of public traffic through or around the work during the warranty period and for erecting or placing, maintaining (including covering and uncovering as needed) and, when no longer required, removing construction area signs at locations shown on the plans, during the warranty period, shall be considered as included in the contract lump sum price paid for warranty and no separate payment will be made therefor.

Except for flagging costs, full compensation for providing the traffic control system shown on the plans (including signs), during the warranty period, shall be considered as included in the contract lump sum price paid for warranty and no separate payment will be made therefor. Flagging costs will be paid for as provided in Section 12-2.02, "Flagging Costs," of the Standard Specifications.

10-1.22 REPLACE CONCRETE PAVEMENT (RAPID STRENGTH CONCRETE)

Replace concrete pavement (Rapid Strength Concrete) shall consist of removing existing portland cement concrete pavement and constructing rapid strength concrete (RSC) pavement as shown on the plans and in conformance with Section 40, "Portland Cement Concrete Pavement," of the Standard Specifications and these special provisions.

DEFINITIONS

The following definitions shall apply to this section:

- A. EARLY AGE. – A time less than 10 times the final set time of the concrete.
- B. FINAL SET TIME. – The elapsed time after initial contact of cement and water, or accelerator, if used, at which a specific penetration resistance of 27.6 MPa is achieved in conformance with the requirements in ASTM Designation: C 403.
- C. OPENING AGE. – The age at which the concrete will achieve the specified strength for opening to public or Contractor traffic.

PRE-OPERATION CONFERENCE

The Contractor and subcontractors involved in construction operations of RSC shall meet with the Engineer at a pre-operation conference, at a mutually agreed time, to discuss methods of accomplishing all phases of the construction operation, contingency planning, and standards of workmanship for the completed item of work.

The Contractor shall provide the facility for the pre-operation conference. The Contractor's superintendent, foremen, subcontractors, plant personnel including plant supervisors, manager, and operator, and field staff involved with RSC shall attend the pre-operation conference. The Contractor will submit a list of participants to the Engineer for approval. The complete listing shall identify each participant's name, employer, title and role in construction of RSC. The pre-operation conference shall be held for no less than 2 hours. Construction operations of RSC shall not begin until the specified personnel have completed the mandatory pre-operation conference.

Full compensation for the pre-operation conference, including furnishing the facility to hold the pre-operation conference in, shall be considered as included in the contract prices paid for the item involving RSC and no additional compensation will be made therefor.

TRIAL SLAB

Prior to beginning work on replacement concrete pavement (RSC), the Contractor shall successfully complete one or more trial slabs for each RSC mix design to be used in constructing RSC pavement. Trial slabs shall be constructed, finished, cured and tested with the materials, tools, equipment, personnel and methods to be used in completing RSC pavement. Trial slabs shall demonstrate that the Contractor is capable of producing RSC pavement in conformance with the provisions in "Replace Concrete Pavement (Rapid Strength Concrete)," within anticipated time periods including delivery, placement, finishing and curing times, and under similar atmospheric and temperature conditions expected during replacement operations. Multiple trial slabs for each RSC mix design may be required to envelop variable atmospheric and temperature conditions.

Minimum trial slab dimensions shall be 3 m by 6 m by 200-mm thick. Trial slabs shall not be placed on the roadway or within project limits. The trial slab shall be placed near the project site at a location mutually acceptable to the Engineer and the Contractor.

During trial slab construction and within 20 minutes of RSC delivery, beams shall be fabricated in conformance with California Test 523. Beams shall be used to determine "early age" and 7-day modulus of rupture values. Beams fabricated for "early age" testing shall be cured so that the monitored temperature in the beams and the trial slab are within 3°C at all times. Internal temperatures of trial slab and "early age" beams shall be monitored and recorded at minimum time intervals of 5 minutes by installing thermocouples and or thermistors connected to strip-chart recorders or digital data loggers. Temperature recording devices shall be accurate to within $\pm 1^\circ\text{C}$. Internal temperature readings shall be measured at 25 mm from the top and 25 mm from the bottom, no closer than 75 mm from any edge of the concrete elements, until "early age" testing is completed. Beams fabricated for 7-day testing shall be cured in conformance with California Test 523 except they shall be placed into sand at between 5 and 10 times final set time or 24 hours, whichever is earlier. Beams failing "early age" or 7-day modulus of rupture requirements shall be cause for rejection of the trial slab.

When proposed by the Contractor, in writing, and approved by the Engineer, ASTM Designation: C 805 or C 900 shall be used to estimate the modulus of rupture of the pavement at early ages. The selected test method shall be used to determine modulus of rupture until 7 days after the Contractor notifies the Engineer of withdrawal of the proposal or 7 days after the Engineer notifies the Contractor of withdrawal of approval, in writing. During trial slab curing, correlation testing shall be performed to determine the relation between the modulus of rupture and ASTM Designation: C 805 or C 900 performed on

the trial slab. The correlation shall be established by testing at 4 or more time intervals. At a minimum, tests shall be performed one hour before and one hour after the opening age and two others within 15 minutes of the opening age. Modulus of rupture estimates shall be calculated with either a linear, exponential or logarithmic, least squares best-fit equation, whichever provides the best correlation coefficient.

Materials resulting from construction of trial slabs and test specimens shall become the property of the Contractor and shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

REMOVING EXISTING PAVEMENT AND BASE MATERIALS

Exact limits of concrete pavement to be replaced will be determined by the Engineer.

Existing concrete pavement shall be removed and replaced with RSC pavement within the same work period. In the event existing pavement are removed and the Contractor is unable to construct, finish, and cure RSC pavement prior to the specified traffic opening time, a temporary roadway structural section shall be constructed.

The outline of concrete pavement to be removed shall be sawed full depth with a power-driven saw except where the pavement is located adjacent to an asphalt concrete shoulder. Saw cuts within concrete pavement slabs shall be cut no more than 2 days prior to concrete pavement slab removal. Saw cuts made in work shifts prior to the actual removal work shift shall not be made parallel or diagonal to the traveled way and shall be cut so that traffic will not dislodge any pieces or segments.

Concrete pavement shall be removed by non-impacting methods. Each pavement panel shall be removed in one or more pieces without disturbance or damage to the underlying base.

Equipment used to remove concrete pavement within the sawed outline, shall not impact the surface of the concrete to be removed within 0.5 m of pavement to remain in place. Pavement removal shall be performed without damage to pavement or base to remain in place. Damage to pavement or base to remain in place, shall be repaired or removed and replaced, as determined by the Engineer. Repair, or removal and replacement of the damaged pavement and base shall be at the Contractor's expense and will not be measured nor paid for.

Removed materials shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The material remaining in place, after removing pavement to the required depth, shall be graded to a uniform plane, moisture conditioned, and compacted by methods that will produce a firm and stable base. The finished surface of the remaining material shall not extend above the grade established by the Engineer. Areas that are low as a result of over excavation during base removal shall be filled, at the Contractor's expense, with base replacement material at the time and in the same operation that the base replacement layer is placed.

TEMPORARY ROADWAY STRUCTURAL SECTION

Asphalt concrete and aggregate base, equal to the quantity of pavement removed during the work shift, shall be provided on site for construction of a temporary roadway structural section where existing pavement is to be replaced. The quantity and location of standby material shall be included in the Contractor's contingency plan in conformance with the requirements of these special provisions. Temporary roadway structural section shall be maintained and later removed as the first order of work when replace concrete pavement (Rapid Strength Concrete) operations resume. The temporary roadway structural section shall consist of 90-mm thick asphalt concrete over aggregate base. RSC not conforming to these special provisions for RSC may be used for temporary roadway structural section with the Engineer's approval.

Aggregate base for temporary roadway structural section shall be produced from commercial quality aggregates consisting of broken stone, crushed gravel, natural rough-surfaced gravel, reclaimed concrete and sand, or any combination thereof. Grading of aggregate base shall conform to the 19-mm maximum grading specified in Section 26-1.02A, "Class 2 Aggregate Base," of the Standard Specifications.

Asphalt concrete for temporary roadway structural section shall be produced from commercial quality aggregates and asphalt binder. Grading of aggregate shall conform to the 19-mm maximum, medium grading in Section 39-2.02, "Aggregate," of the Standard Specifications and asphalt binder shall conform to requirements for liquid asphalt SC-800 in Section 93, "Liquid Asphalts," of the Standard Specifications. Amount of asphalt binder to be mixed with the aggregate shall be approximately 0.3 percent less than the optimum bitumen content determined in conformance with the requirements in California Test 367.

Aggregate base and asphalt concrete for the temporary roadway structural section shall be spread and compacted by methods that will produce a well-compacted, uniform base, with a surface of uniform smoothness, texture and density. Surfaces shall be free from pockets of coarse or fine material. Aggregate base may be spread and compacted in one layer. Asphalt concrete may be spread and compacted in one layer. Finished surface of asphalt concrete shall not vary more than 15 mm from the lower edge of a 3.6-m ± 0.06 m long straightedge placed parallel with the centerline and shall match the elevation of existing concrete pavement along the joints between the existing pavement and temporary surfacing.

Removed temporary roadway structural section materials shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications, except that removed aggregate base may be stockpiled at the project site and reused for construction of temporary roadway structural sections. When no longer required, standby material or stockpiled material for construction of temporary roadway structural sections shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

RAPID STRENGTH CONCRETE

General

Rapid Strength Concrete (RSC) shall be a concrete made with hydraulic cement that develops opening age and 7-day specified modulus of rupture strengths.

Requirements of Sections 40-1.015, "Cement Content," 40-1.05, "Proportioning," and 90-1.01, "Description," of the Standard Specifications shall not apply.

Combined aggregate grading used in RSC shall be either the 37.5-mm, maximum grading, or 25-mm, maximum grading, at the option of the Contractor.

Cement for RSC shall be hydraulic cement as defined in ASTM Designation: C 219 and shall conform to the following requirements:

Test Description	Test Method	Requirement
Contraction in Air	California Test 527, W/C Ratio = 0.39 ± 0.010	0.053 %, max.
Mortar Expansion in Water	ASTM Designation: C 1038	0.04 %, max.
Soluble Chloride*	California Test 422	0.05 %, max.
Soluble Sulfates*	California Test 417	0.30 %, max.
Thermal Stability	California Test 553	60 %, min.
Compressive Strength @ 3 days	ASTM Designation: C 109	17 MPa

*Test is to be done on a cube specimen, fabricated in conformance with the requirements in ASTM

Designation: C 109, cured at least 14 days and then pulverized to 100% passing the 300- μ m sieve

At least 45 days prior to intended use, the Contractor shall furnish a sample of cement from each lot proposed for use and all admixtures proposed for use in the quantities ordered by the Engineer.

The Contractor shall submit uniformity reports for cement used in RSC to the Engineer. Uniformity reports shall conform to the requirements in ASTM Designation: C 917, except that testing age and water content may be modified to suit the particular material. Uniformity reports shall be submitted at least every 30 days during RSC pavement operations.

Type C accelerating chemical admixtures conforming to the provisions in Section 90-4, "Admixtures," of the Standard Specifications may be used. In addition to the admixtures listed on the Department's current list of approved admixtures, citric acid or borax may be used if requested in writing by the cement manufacturer and a sample is submitted to the Engineer. Chemical admixtures, if used, shall be included in the testing for requirements listed in the table above.

At least 10 days prior to use in the trial slab, the Contractor shall submit a mix design for RSC that shall include the following:

- A. Opening age
- B. Proposed aggregate gradings
- C. Mix proportions of hydraulic cement and aggregate
- D. Types and amounts of chemical admixtures
- E. Maximum time allowed between batching RSC and placing roadway pavement
- F. Range of ambient temperatures over which the mix design is effective (10°C maximum range)
- G. Final set time of the concrete
- H. Any special instructions or conditions, including but not limited to, water temperature requirements when appropriate

The Contractor shall submit more than one mix design to plan for ambient temperature variations anticipated during placement of the roadway pavement. Each mix shall be designed for a maximum ambient temperature range of 10°C. The Contractor shall furnish samples of the cement, aggregates and chemical admixtures proposed for use in RSC pavement in quantities ordered by the Engineer. The Contractor shall develop and furnish modulus of rupture development data for each proposed mix design. Modulus of rupture development data for up to 7 days shall be provided to the Engineer prior to

beginning paving operations. Modulus of rupture development data may be developed from laboratory prepared samples. The testing ages for modulus of rupture development data shall include one hour before opening age, opening age, one hour after opening age, 24 hours, 7 days and 28 days.

Concrete pavement penetration requirements in Section 90-6.06, "Amount of Water and Penetration," of the Standard Specifications shall not apply to RSC.

RSC pavement shall develop a minimum modulus of rupture of as specified in "Pay Factor Adjustment for Low Modulus of Rupture" of these special provisions before opening to public or Contractor traffic. In addition, RSC pavement shall develop a minimum modulus of rupture of 4.2 MPa in 7 days after placement. RSC pavement that attains a modulus of rupture of less than specified may be accepted in conformance with "Pay Factor Adjustment for Low Modulus of Rupture" specified herein. Modulus of rupture shall be determined by averaging results from 3 beam specimens tested in conformance with the requirements in California Test 523. Beam specimens may be fabricated using an internal vibrator in conformance with the requirements in ASTM Designation: C 31. No single test shall represent more than the production of that day or 100 cubic meters, whichever is less.

Modulus of rupture at "early age" may be estimated using the correlation established during trial slab placement or by using results from beam specimens cured under atmospheric conditions and at a temperature within 3°C of the pavement. Modulus of rupture at other ages will be determined using beams cured and tested in conformance with California Test 523 except beams will be placed into sand between 5 and 10 times final set time or 24 hours, whichever is earlier. The Engineer will perform the testing to determine modulus of rupture values of the RSC pavement. The modulus of rupture, as determined above, will be the basis for accepting or rejecting the RSC pavement for modulus of rupture requirements.

Pay Factor Adjustment for Low Modulus of Rupture

Where planned replacement pavement nominal thickness is less than 255 mm, payment for replace concrete pavement (Rapid Strength Concrete) will be adjusted for low modulus of rupture tests as follows:

- A. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of 2.8 MPa or greater before the lane is opened to the traffic and 7-day modulus of rupture of 4.2 MPa or greater will be paid for at the contract unit price paid per cubic meter for replace concrete pavement (Rapid Strength Concrete).
- B. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of equal to or less than 2.8 MPa before the lane at opened to traffic and 7-day modulus of rupture of less than 3.4 MPa will not be paid for, and shall be removed and replaced, at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions. The concrete pavement with low modulus of rupture subject to removal may be used as temporary roadway structural section, until replacement concrete pavement conforming to the requirements of these special provisions is in place.
- C. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of 2.1 MPa or greater before the lane is opened to traffic will be paid for at a percentage of the contract unit price paid per cubic meter for replace concrete pavement (Rapid Strength Concrete) in conformance with the following percentage pay table:
- D. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of less than 2.1 MPa when the lane is opened to traffic will be rejected and shall be removed and replaced at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions.

Percentage Pay Table

Modulus of Rupture (MPa) at opening to traffic	7-Day Modulus of Rupture (MPa)		
	Greater than or equal to 4.20	Less than 4.20 and greater than or equal to 3.80	Less than 3.80 and greater than or equal to 3.40
Greater than or equal to 2.80	100%	95%	90%
Less than 2.80 and greater than or equal to 2.40	95%	95%	90%
Less than 2.40 and greater than or equal to 2.10	80%*	80%*	80%*

*Note: Any replacement panel with an 80 percent pay factor that develops one or more continuous full depth transverse cracks within 21 days after placement shall be removed and replaced at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions. A continuous crack is defined as a crack running between the longitudinal edges of the panel.

Where planned replacement pavement nominal thickness is 255 mm or greater, payment for replace concrete pavement (Rapid Strength Concrete) will be adjusted for low modulus of rupture tests as follows:

- A. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of 2.3 MPa or greater before the lane is opened to the traffic and 7-day modulus of rupture of 4.2 MPa or greater will be paid for at the contract unit price paid per cubic meter for replace concrete pavement (Rapid Strength Concrete).
- B. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of equal to or less than 2.3 MPa before the lane at opened to traffic and 7-day modulus of rupture of less than 3.4 MPa will not be paid for, and shall be removed and replaced, at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions. The concrete pavement with low modulus of rupture subject to removal may be used as temporary roadway structural section, until replacement concrete pavement conforming to the requirements of these special provisions is in place.
- C. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of 1.8 MPa or greater before the lane is opened to traffic will be paid for at a percentage of the contract unit price paid per cubic meter for replace concrete pavement (Rapid Strength Concrete) in conformance with the following percentage pay table:
- D. Replace concrete pavement (Rapid Strength Concrete) with modulus of rupture of less than 1.8 MPa when the lane is opened to traffic will be rejected and shall be removed and replaced at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions.

Percentage Pay Table

Modulus of Rupture (MPa) at opening to traffic	7-Day Modulus of Rupture (MPa)		
	Greater than or equal to 4.20	Less than 4.20 and greater than or equal to 3.80	Less than 3.80 and greater than or equal to 3.40
Greater than or equal to 2.30	100%	95%	90%
Less than 2.30 and greater than or equal to 2.00	95%	95%	90%
Less than 2.00 and greater than or equal to 1.80	80%*	80%*	80%*

*Note: Any replacement panel with an 80 percent pay factor that develops one or more continuous full depth transverse cracks within 21 days after placement shall be removed and replaced at the Contractor's expense with replace concrete pavement (Rapid Strength Concrete) conforming to the requirements of these special provisions. A continuous crack is defined as a crack running between the longitudinal edges of the panel.

The Contractor shall pay to the State adjustments in payment for low modulus of rupture tests in conformance with the requirements specified in the tables in this section. The Department will deduct the amount of the adjustments from moneys due or that may become due, the Contractor under the contract.

Proportioning

Weighing, measuring and metering devices used for proportioning materials shall conform to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications and these special provisions.

Over and under dials, and other indicators for weighing and measuring systems used in proportioning materials shall be grouped so that the smallest increment for each indicator can be accurately read from the point at which the proportioning operation is controlled for ingredients batched at a central batch plant. In addition, indicators for weighing and measuring cement batched from a remote weighing system shall also be placed so that each indicator can be accurately read from the point at which the proportioning operation is controlled.

Aggregates shall be handled and stored in conformance with the provisions in Section 90-5.01, "Storage of Aggregates," of the Standard Specifications. Liquid admixtures shall be proportioned in conformance with the provisions in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures," of the Standard Specifications. Mineral admixtures shall be protected from exposure to moisture until used. Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures to easily track the materials that are entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper.

Weighing equipment shall be insulated against vibration or movement of other operating equipment. When the plant is in operation, the mass of each draft of material shall not vary from the designated mass by more than the tolerances specified herein. Each scale graduation shall be 0.001 of the usable scale capacity.

Aggregate shall be weighed cumulatively and equipment for the weighing of aggregate shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the aggregate. Equipment for the separate weighing of the cement or mineral admixture shall have a zero tolerance of ± 0.5 percent of their designated individual batch drafts. Equipment for measuring water shall have a zero tolerance of ± 0.5 percent of its designated mass or volume.

The mass indicated for any individual batch of material shall not vary from the preselected scale setting by more than the following:

Material	Tolerance
Aggregate	± 1.0 percent of designated batch mass
Cement	± 0.5 percent of designated batch mass
Mineral Admixture	± 1.0 percent of designated batch mass
Water	± 1.5 percent of designated batch mass or volume

Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cement, mineral admixture and water as provided in these special provisions. Dry ingredients shall be proportioned by mass. Liquid ingredients shall be proportioned by mass or volume.

At the time of batching, aggregates shall have been dried or drained sufficiently to result in stable moisture content, so that no visible separation of water from aggregate will take place during the proportioning process. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

If separate supplies of aggregate material of the same size group with different moisture content or specific gravity or surface characteristics affecting workability are available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another supply.

Cement shall be kept separate from the aggregates until released for discharge into the mixer. Cement shall be free of lumps and clods when discharged into the mixer. Fabric containers used for transportation or proportioning of cement shall be clean and free of residue before reuse.

Weigh systems for proportioning aggregate, cement, and mineral admixture shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and distinct material-weighing device.

For batches with a volume of one cubic meter or more, proportioning equipment shall conform to one of the following methods:

- A. All ingredients shall be batched at a central batch plant and charged into a mixer truck for transportation to the pour site. Ingredient proportioning shall meet the requirements of Section 90-5, "Proportioning," of the Standard Specifications.
- B. All ingredients except the cement shall be batched at a central batch plant and charged into a mixer truck for transportation to a remote located silo and weigh system for the proportioning of the cement. The remote system shall proportion cement for charging the mixer truck.
- C. All ingredients except the cement shall be batched at a central batch plant and charged into a mixer truck for transportation to a remote location where pre-weighed, containerized cement shall be added to the mixer truck. The cement pre-weighing operation shall utilize a platform scale. The platform scale shall have a maximum capacity of 2.5 tonnes with a maximum graduation size of 0.5 kilograms. Cement shall be pre-weighed into a fabric container. The minimum amount of cement to be proportioned into any single container shall be one half of the total amount required for the load of RSC being produced.
- D. Cement, water, and aggregate shall be proportioned volumetrically in conformance with these special provisions.

In order to check the accuracy of batch masses, the gross mass and tare mass of truck mixers shall be determined when ordered by the Engineer. The equipment shall be weighed at the Contractor's expense on scales designated by the Engineer.

The Contractor shall install and maintain in operating condition an electrically actuated moisture meter. The meter shall indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched. The meter shall have a sensitivity of 0.5 percent by mass of the fine aggregate.

No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced. Water added to the truck mixer at the job site shall be measured through a meter that conforms to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

Aggregate discharged from several bins shall be controlled by gates or by mechanical conveyors. The means of discharge from the bins and from the weigh hopper shall be interlocked so that no more than one bin can discharge at a time, and so that the weigh hopper can not be discharged until the required quantity from each of the bins has been deposited in the weigh hopper.

Weighmaster Certificates

Weighmaster certificates for RSC, regardless of the proportioning method used, shall include all information necessary to trace the manufacturer, and manufacturer's lot number for the cement being used. When proportioned into fabric containers the weighmaster certificates for the cement shall contain date of proportioning, location of proportioning and actual net draft mass of the cement. When proportioned at the pour site from a storage silo the weighmaster certificates shall contain date of proportioning, location of proportioning and the net draft mass of the cement used in the load.

Volumetric Proportioning

When RSC is proportioned by volume, the method shall conform to requirements specified herein.

Aggregates shall be handled and stored in conformance with the provisions in Section 90-5.01, "Storage of Aggregates," of the Standard Specifications. Liquid admixtures shall be proportioned in conformance with the provisions in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures," of the Standard Specifications. Mineral admixtures shall be protected from exposure to moisture until used. Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the batch-mixer storage hopper or in the feed line.

Batch-mixer trucks shall be equipped to proportion cement, water, aggregate and additives by volume. Aggregate feeders shall be connected directly to the drive on the cement vane feeder. The cement feed rate shall be tied directly to the feed rate for the aggregate and other ingredients. Any change in the ratio of cement to aggregate shall be accomplished by changing the gate opening for the aggregate feed. The drive shaft of the aggregate feeder shall be equipped with a revolution counter reading to the nearest full or partial revolution of the aggregate delivery belt.

Aggregate shall be proportioned using a belt feeder operated with an adjustable cutoff gate delineated to the nearest quarter increment. Height of the gate opening shall be readily determinable. Cement shall be proportioned by a method that conforms to the accuracy requirements of these special provisions. Water shall be proportioned by a meter conforming to the provisions in Section 9-1.01, "Measurement and Payment," of the Standard Specifications and these special provisions.

Delivery rate of aggregate and cement per revolution of the aggregate feeder shall be calibrated at appropriate gate settings for each batch-mixer truck used on the project and for each aggregate source. Batch-mixer trucks shall be calibrated at 3 different aggregate gate settings that are commensurate with production needs. Two or more calibration runs shall be required at each of the different aggregate gate openings. The actual mass of material delivered for aggregate proportioning device calibrations shall be determined by a platform scale as specified in these special provisions.

Aggregate belt feeder shall deliver aggregate to the mixer with volumetric consistency so that deviation for any individual aggregate delivery rate check-run shall not exceed 1.0 percent of the mathematical average of all runs for the same gate opening and aggregate type. Each test run shall be at least 500 kg. Fine aggregate used for calibration shall not be reused for device calibration.

At the time of batching, aggregates shall have been dried or drained sufficiently to result in stable moisture content, so that no visible separation of water from aggregate will take place during the proportioning process. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

If separate supplies of aggregate material of the same size group with different moisture content or specific gravity or surface characteristics affecting workability are available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another supply.

Rotating and reciprocating equipment on batch-mixer trucks shall be covered with metal guards.

The cement proportioning system shall deliver cement to the mixer with a volumetric consistency so that the deviation for any individual delivery rate check-run shall not exceed 1.0 percent of the mathematical average of 3 runs of at least 500 kg each. Cement used for calibration shall not be reused for device calibration.

Water meter accuracy shall be such that, when operating between 50 percent and 100 percent of production capacity, the difference between the indicated mass of water delivered and the actual mass delivered shall not exceed 1.5 percent of the actual mass for each of two individual runs of 1200 liters. The water meter shall be calibrated in conformance with California Test 109 and shall be equipped with a resettable totalizer and display the operating rate.

Calibration tests for aggregate, cement and water proportioning devices shall be conducted with a platform scale located at the calibration site. Weighing of test run calibration material shall be performed on a platform scale having a maximum capacity not exceeding 2.5 tonnes with maximum graduations of 0.5 kg. The platform scale shall be error tested within

8 hours of calibration of batch-mixer truck proportioning devices. Error testing shall be performed with test masses conforming to California Test 109 and shall produce a witness scale that is within 2 graduations of the test mass load. The scale shall be available for use at the production site throughout the production period. Equipment needed for the calibration of proportioning systems shall remain available at the production site throughout the production period.

The batch-mixer truck shall be equipped so that an accuracy check can be made prior to the first operation for the project and at any other time as directed by the Engineer. Further calibration of proportioning devices shall be required every 30-calendar days after production begins or when the source or type of any ingredient is changed. A spot calibration shall consist of calibration of the cement proportioning system only. A two run spot re-calibration of the cement proportioning system shall be performed each time 50 tonnes of cement has passed through the batch-mixer truck. Should the spot re-calibration of the cement proportioning system fall outside the limitations specified herein, a full calibration of the cement proportioning system shall be completed before the resumption of production.

Liquid admixtures shall be proportioned by a meter.

Cement storage shall be located immediately before the cement feeder and shall be equipped with a device that will automatically shut down the power to the cement feeder and aggregate belt feeder when the cement storage level is lowered to a point where less than 20 percent of the total volume is left in storage.

The Contractor shall furnish aggregate moisture determinations, made in conformance with California Test 223, at least every 2 hours during proportioning and mixing operations. Moisture determinations shall be recorded and presented to the Engineer at the end of the production shift.

Each aggregate bin shall be equipped with a device that will automatically shut down the power to the cement feeder and the aggregate belt feeder when the aggregate discharge rate is less than 95% of the scheduled discharge rate of any bin.

Indicators specified herein shall be in working order prior to commencing proportioning and mixing operations and shall be visible when standing near the batch-mixer truck.

Identifying numbers of batch-mixer trucks shall be at least 75 mm in height, and be located on the front and rear of the vehicles.

Volumetric proportioned RSC shall be mixed in a mechanically operated mixer of adequate size and power for the type of RSC to be placed. Mixers may be of the auger type and shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers that have an accumulation of hard concrete or mortar shall be removed from service until cleaned. Other types of mixers may be used provided mixing quality will meet the requirements of these special provisions.

Charge or rate of feed to the mixer shall not exceed that which will permit complete mixing of the materials. Dead areas in the mixer, where material does not move or is not sufficiently agitated, shall be corrected by a reduction in the volume of material or by other adjustments. The mixer shall be designed to provide sufficient mixing action and movement to produce properly mixed RSC. Mixing shall continue until a homogeneous mixture is produced at discharge from the mixer. There shall be no lumps or evidence of non-dispersed cement at discharge from the mixer. No water shall be added to the RSC after discharge from the mixer.

Equipment having components made of aluminum or magnesium alloys, which may have contact with plastic concrete during mixing or transporting of RSC, shall not be used.

Uniformity of concrete mixtures will be determined by differences in conformance with the provisions in California Test 533. Difference in penetration, determined by comparing penetration tests on two samples of mixed concrete from the same batch or truck mixer load, shall not exceed 15 mm. The Contractor shall furnish samples of freshly mixed concrete and provide facilities for obtaining the samples. Sampling facilities shall be safe, accessible, clean and produce a sample which is representative of production. Sample devices and sampling methods shall also meet the requirements of California Test 125.

Ice shall not be used to cool RSC directly. When ice is used to cool water used in the mix, all of the ice shall be melted before entering the mixer.

Cement shall be proportioned and charged into the mixer by means that will result in no losses of cement due to wind, or due to accumulation on equipment, or other conditions which will vary the required quantity of cement.

Each mixer shall have a metal plate or plates, prominently attached, on which the following information is provided:

- A. Uses for which the equipment is designed.
- B. Manufacturer's guaranteed capacity of the mixer in terms of the volume of mixed concrete.
- C. Speed of rotation of the mixer.

Consistency and workability of mixed concrete when discharged at the delivery point shall be suitable for placement and consolidation.

Information generated by volumetric devices will not be used for payment calculations.

The device that controls the proportioning of cement, aggregate and water shall produce a log of production data. The log of production data shall consist of a series of snapshots captured at 15-minute intervals throughout the period of daily production. Each snapshot of production data shall be a register of production activity at that time and not a summation of the data over the preceding 15 minutes. The amount of material represented by each snapshot shall be the amount produced in the period of time from 7.5 minutes before to 7.5 minutes after the capture time. The daily log shall be submitted to the Engineer, in electronic or printed media, at the end of each production shift or as requested by the Engineer, and shall include the following:

- A. Mass of cement per revolution count.
- B. Mass of each aggregate size per revolution count.
- C. Gate openings for each aggregate size being used.
- D. Mass of water added to the concrete per revolution count.
- E. Moisture content of each aggregate size being used.
- F. Individual volume of all other admixtures per revolution count.
- G. Time of day.
- H. Day of week.
- I. Production start and stop times.
- J. Batch-mixer truck identification.
- K. Name of supplier.
- L. Specific type, size, or designation of concrete being produced.
- M. Source of the individual aggregate sizes being used.
- N. Source, brand and type of cement being used.
- O. Source, brand and type of individual admixtures being used.
- P. Name and signature of operator.

Required report items may be input by hand into a pre-printed form or captured and printed by the proportioning device. Electronic media containing recorded production data shall be presented in a tab delimited format on a 90-mm diskette with a capacity of at least 1.4 megabytes. Each snapshot of the continuous production shall be followed by a line-feed carriage-return with allowances for sufficient fields to satisfy the amount of data required by these specifications. The reported data shall be in the above order and shall include data titles at least once per report.

Bond Breaker

Bond breaker shall be placed between replacement pavement and existing lean concrete, cement treated base or new base replacement layer. Bond breaker shall be one of the following:

- A. Curing paper conforming to the requirements in ASTM Designation: C 171, white.
- B. Polyethylene film conforming to the requirements in ASTM Designation: C 171, except that the minimum thickness shall be 0.15 mm, white opaque.
- C. Paving asphalt, Grade AR-4000, conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications.
- D. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A, containing a minimum of 22 percent nonvolatile vehicles consisting of at least 50 percent paraffin wax.

When curing paper or polyethylene film is used, material shall be placed in a wrinkle free manner. Adjacent sheets shall be overlapped a minimum of 150 mm.

When curing compound or paving asphalt is used, all foreign and loose materials remaining from slab removal shall be removed prior to application.

When paving asphalt is used, no water shall be added before applying asphalt to the surface of the base. The paving asphalt shall be applied in one even application at a rate of 0.10 to 0.45 L/m² over the entire base surface area. Concrete pavement shall not be placed until the paving asphalt has cured.

When curing compound is used, the curing compound shall be applied in two separate applications. Each application shall be applied evenly at a rate of 0.3 to 0.5 L/m² over the entire base surface area.

Spreading, Compacting and Shaping

Metal or wood side forms may be used. When wood side forms are used they shall not be less than 38-mm thick. Side forms shall be of sufficient rigidity, both in the form and in the connection with adjoining forms, that movement will not occur under the force from subgrading and paving equipment or from the pressure of concrete.

Side forms shall remain in place until the pavement edge no longer requires the protection of forms. Side forms shall be thoroughly cleaned and oiled prior to each use.

Consolidation of RSC shall be by means of high-frequency internal vibrators after the RSC is deposited on the subgrade. Vibrating shall be done in a manner to assure uniform consolidation adjacent to forms and across the full paving width. RSC shall be placed as nearly as possible in its final position and use of vibrators for extensive shifting of the mass of RSC will not be permitted.

RSC shall be spread and shaped by suitable powered finishing machines and supplemented by hand finishing as necessary. Methods of spreading, shaping and consolidating that result in segregation, voids or rock pockets shall be discontinued. The Contractor shall use methods that will produce dense homogeneous pavement conforming to the required cross section.

After the RSC has been mixed and placed, no additional water shall be added to the surface to facilitate finishing. Surface finishing additives, when used, shall be as recommended by the manufacturer of the cement and shall be approved by the Engineer prior to use.

Joints

Prior to placing concrete against existing concrete, a 6-mm thick commercial quality polyethylene flexible foam expansion joint filler shall be placed across the original transverse and longitudinal joint faces and extend the full depth of the excavation. The top of the joint filler shall be placed flush with the top of pavement. Joint filler shall be secured to the joint face of the existing pavement by a method that will hold the joint filler in place during the placement of concrete.

Transverse weakened plane joints in slab replacement shall be constructed to match the spacing and skew of the weakened plane joints in the adjacent existing pavement. Where the existing transverse weakened plane joint spacing in an adjacent lane exceeds 4.6 m, an additional transverse weakened plane joint shall be constructed midway between the existing joints. The provisions in the second and third paragraphs in Section 40-1.08B, "Weakened Plane Joints," and the third paragraph in Section 40-1.08B(1), "Sawing Method," shall not apply. Sawing of weakened plane joints shall be completed within 2 hours of completion of final finishing. Minimum depth of cut for weakened plane joints shall be 70 mm.

Final Finishing

Tests to determine coefficient of friction of the final textured surface will be made only if the Engineer determines by visual inspection that the final texturing may not have produced a surface having the specified coefficient of friction. Any tests to determine the coefficient of friction will be made after the pavement is opened to public traffic, but not later than 5 days after concrete placement. Pavement areas having a coefficient of friction as determined in conformance with the requirements in California Test 342 of less than 0.30 shall be grooved in conformance with the provisions in Section 42-1.02, "Construction," of the Standard Specifications. Grooving shall be performed prior to the installation of any required edge drains adjacent to the areas to be grooved.

Transverse straightedge and longitudinal straightedge requirements will not apply to the pavement surface within 300 mm of the existing concrete pavement except as required in these special provisions. Longitudinal straightedge requirements in Section 40-1.10, "Final Finishing," of the Standard Specifications, shall be applied at transverse contact joints with existing concrete pavement where the straightedge is to be placed with the midpoint coincident with the joints. Pavement not meeting this straightedge requirement shall be corrected within 48 hours by grinding or other methods as approved by the Engineer.

Profiles of the completed pavement surface specified in Section 40-1.10, "Final Finishing," of the Standard Specifications will not be required. The Profile Index requirements in Section 40-1.10, "Final Finishing," of the Standard Specifications shall not apply.

Curing Method

The curing method for replacement pavement shall be as recommended by the manufacturer of the cement and as approved by the Engineer.

REPLACE EXISTING PAVEMENT DELINEATION

Whenever existing pavement delineation is removed, obliterated or damaged due to the work involved in replacing concrete pavement, the Contractor shall replace the delineation in conformance with the requirements of these special provisions.

MEASUREMENT AND PAYMENT

Replace concrete pavement (Rapid Strength Concrete) will be measured and paid for in the same manner specified for concrete pavement in Sections 40-1.13, "Measurement," and 40-1.14, "Payment," of the Standard Specifications, and these special provisions.

Replace concrete pavement (Rapid Strength Concrete) payments will be subject to the pay factor values listed in "Pay Factor Adjustment for Low Modulus of Rupture" of these special provisions.

The provisions in Section 40-1.135, "Pavement Thickness," of the Standard Specifications shall not apply.

Full compensation for removing and disposing of existing concrete pavement, constructing trial slabs, furnishing and placing bond breaker, furnishing and disposing of standby materials for temporary roadway structural section, and constructing, maintaining, removing and disposing of temporary roadway structural section, shall be considered as included in the contract price paid per cubic meter for replace concrete pavement (Rapid Strength Concrete), and no additional compensation will be allowed therefor.

ENGINEER'S ESTIMATE
04-135994

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	070010	PROGRESS SCHEDULE (CRITICAL PATH)	LS	LUMP SUM	LUMP SUM	
2	BLANK					
3	022678	TEMPORARY CONCRETE WASHOUT FACILITY	LS	LUMP SUM	LUMP SUM	
4	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM	LUMP SUM	
5 (S)	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM	LUMP SUM	
6	128650	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2		
7	150714	REMOVE THERMOPLASTIC TRAFFIC STRIPE	M	210		
8	150722	REMOVE PAVEMENT MARKER	EA	19 600		
9	153103	COLD PLANE ASPHALT CONCRETE PAVEMENT	M2	1340		
10	022679	REPLACE EDGE DRAIN (80 MM)	M	370		
11	153235	CLEAN BRIDGE DECK	M2	8410		
12	260210	AGGREGATE BASE (APPROACH SLAB)	M3	78		
13	374206	SEAL RANDOM CRACKS	LNKM	3		
14	390095	REPLACE ASPHALT CONCRETE SURFACING	M3	290		
15	BLANK					
16	BLANK					
17	BLANK					
18	420201	GRIND EXISTING CONCRETE PAVEMENT	M2	206 000		
19	022682	TEXTURE GRIND CONCRETE PAVEMENT	M2	48 500		
20 (F)	510087	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE R)	M3	776		

ENGINEER'S ESTIMATE
04-135994

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
21	510800	PAVING NOTCH EXTENSION	M3	17		
22 (F)	511118	CLEAN EXPANSION JOINT	M	54		
23 (S)	048802	JEENE SEAL (65W)	M	37		
24 (S)	519117	JOINT SEAL (MR 30 MM)	M	96		
25 (S)	519120	JOINT SEAL (MR 15 MM)	M	100		
26 (S)	519142	JOINT SEAL (MR 40 MM)	M	92		
27 (F)	540102	TREAT BRIDGE DECK	M2	8410		
28	540109	FURNISH BRIDGE DECK TREATMENT MATERIAL (LOW ODOR)	L	3365		
29 (S)	840560	THERMOPLASTIC TRAFFIC STRIPE (SPRAYABLE)	M	420		
30 (S)	840656	PAINT TRAFFIC STRIPE (2-COAT)	M	35 900		
31 (S)	850101	PAVEMENT MARKER (NON- REFLECTIVE)	EA	14 700		
32 (S)	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	4910		
33 (S)	860930	TRAFFIC MONITORING STATION	LS	LUMP SUM	LUMP SUM	
34	BLANK					
35	070020	WARRANTY	LS	LUMP SUM	LUMP SUM	
36	190185	SHOULDER BACKING	STA	200		
37	198007	IMPORTED MATERIAL (SHOULDER BACKING)	TONNE	1340		
38	390106	ASPHALT CONCRETE (OPEN GRADED)	TONNE	3600		
39	022937	RUBBERIZED ASPHALT CONCRETE (TYPE O-HB)	TONNE	10 300		
40	022938	REPLACE CONCRETE PAVEMENT (RAPID STRENGTH CONCRETE)	M3	540		

ENGINEER'S ESTIMATE
04-135994

Item	Item Code	Item	Unit of Measure	Estimated Quantity	Unit Price	Item Total
41	999990	MOBILIZATION	LS	LUMP SUM	LUMP SUM	

TOTAL BID: _____